(12) UK Patent Application (19) GB (11) 2 254 529 (13) A

(43) Date of A publication 07.10.1992

(21) Application No 9206253.8

(22) Date of filing 23.03.1992

(30) Priority data
(31) 9106111 (32) 22.03.1991 (33) GB

(51) INT CL[5]
H04L 12/56, H04Q 11/04

(52) UK CL (Edition K)
H4P PPS

(56) Documents cited
None

(58) Field of search
UK CL (Edition K) H4P PPS
INT CL[5] H04L 12/28 12/56
On-line WPI, INSPEC

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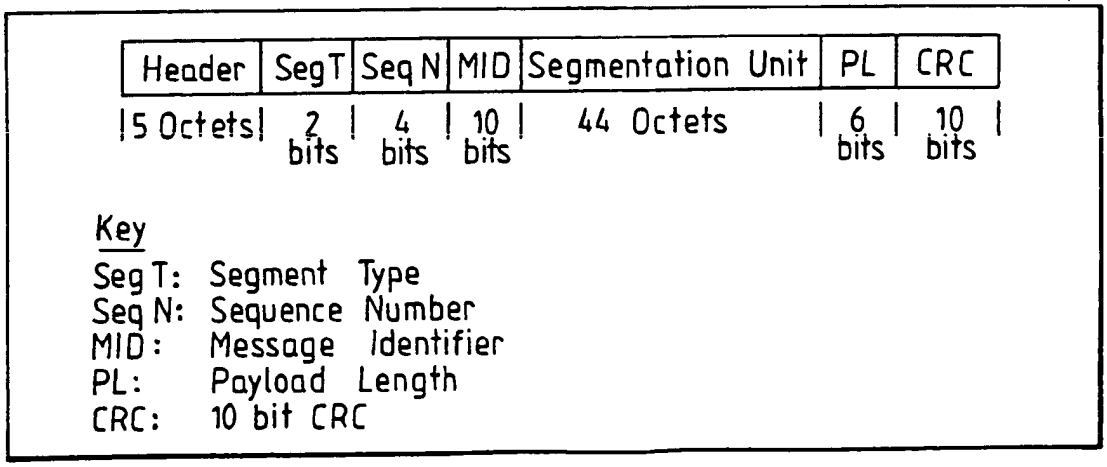
(54) **Connectionless switching for an ATM or DQDB switch**

(57) In a telecommunications system where a node has to through a packet switched network send a message which is of a length greater than the maximum packet size, the message is divided into smaller packets which are sent individually through the network. The packets may be sent by what is known as a connectionless service where each packet is treated independently.

It is proposed that the packets are sent by a method of transmitting variable length messages on a telecommunications network from a source to a destination via an ATM or DQDB switch in fixed length cells or slots which include a header field and a payload field wherein the method includes providing a segment type field, a sequence number field and a message identifier field in the payload field and wherein the routing information is obtained without use of the Virtual Path or Circuit Identifiers.

The routing information is obtained from a connectionless messages destination address field associated with the message identifier field.

Fig.1



At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

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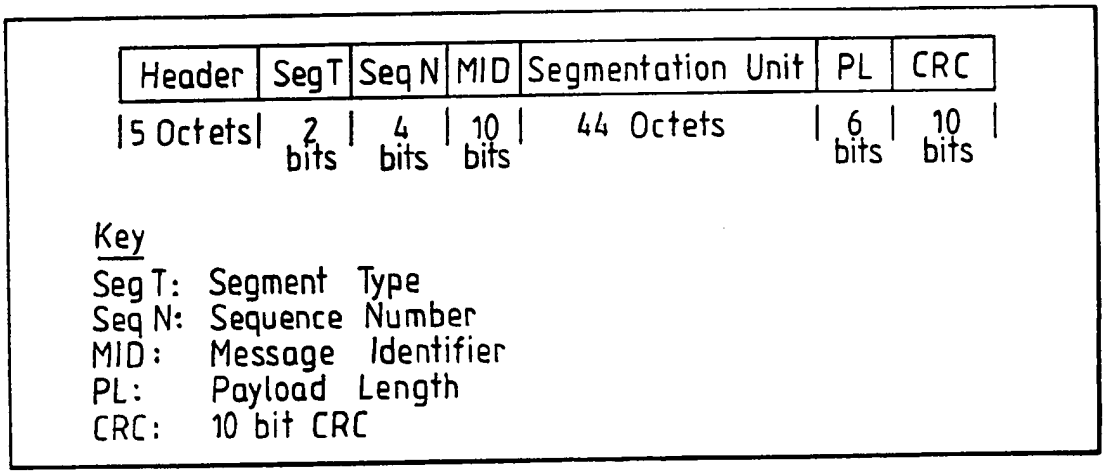
Fig.1


Header
SegT
Seq N
MID
Segmentation Unit
PL
CRC
5 Octets
2 bits
4 bits
10 bits
44 Octets
6 bits
10 bits
Key
SegT: Segment Type
Seq N: Sequence Number
MID: Message Identifier
PL: Payload Length
CRC: 10 bit CRC

CONNECTIONLESS SWITCHING FOR AN ATM SWITCH

Where a node has to send a message through a packet switched network which is of a length greater than the maximum packet size, the message is divided into smaller packets which are sent individually through the network. There are two approaches to sending the stream of packets through the network:-

the datagram or connectionless service

the virtual circuit or connection oriented service.

In the connectionless service each packet is treated independently, with no reference to packets that have gone before. As a result different packets may follow different routes through the network and may arrive at the destination node in a different sequence from that in which they were sent.

In the connection oriented service a pre-planned route is established before any packets are sent. Consequently, all packets will arrive in the order in which they were sent.

If it is required that two nodes exchange data over an extended period of time, there are certain advantages to virtual circuits, chief of which is sequencing and error control.

The advantages of connectionless service are that call set-up time is avoided which is an advantage for short transactions, network congestion can be by-passed improving performance and network failures can be by-passed improving reliability.

The Distributed Queue Dual Bus (DQDB) protocol specifies a

hybrid network capable of carrying connectionless data as well as connection oriented and isochronous data. The standard for this protocol is specified by the IEEE 802.6 Committee. However, the standardisation activity has been concentrated on defining the connectionless part of the standard and as a result, the definition of the remaining service types has been delayed.

The format of the connectionless data carrying DQDB slot is shown in Figure 1 and is identical to the proposed format of the ATM cell for the Type 4 ATM Adaption Layer (AAL-4). The AAL-4 format was originally intended to meet the needs of a connectionless, variable bit rate service class of traffic but has been enhanced to provide facilities for assured/unassured delivery and streaming mode traffic and may also be used in a connection oriented environment. Consequently there will be no special format problems generated by the interworking of DQDB and ATM at the payload level.

Referring to Figure 1:-

The Segment type (Seg T) field identifies the segment as the Beginning of Message (BOM), a Continuation of Message (COM), the End of Message (EOM) segment or as a Single Segment Message (SSM);

The Sequence Number (SeqN) field contains a modulo 16 sequence of numbers which should be consecutive for each of the segments in a message;

The SeqN field will be used at the receiver to detect lost or misinserted (which includes duplicated) segments;

The Message Identifier (MID) field allows several messages to be multiplexed on the same virtual channel;

The value of the MID field is therefore unique for each sequence of segments comprising a message on a DQDB network. Similarly, in the case of an ATM network, the MID is also unique;

The Payload Length (PL) field contains a number which is a multiple of 4 in the range 4 to 44. This allows the segment contents to contain multiples of 32 bits for ease of processing;

Lastly, the 10 bit Cyclic Redundancy Check (CRC) gives error coverage of all the above segment fields and provides for the detection of errors and the correction of single bit errors.

A DQDB based Metropolitan Area Network (MAN) requires that

the DQDB sub-networks (dual busses) are interconnected to form an extended DQDB network which will form the core of the MAN. There are two ways in which this may be achieved:-

(i) To interconnect DQDB sub-networks using a 'backbone' sub-network. This is similar to the approach adopted by QPSX Communications Limited for their MAN Switching System (MSS) and which may be the preferred option for initial MAN options.

(ii) The other option, which is likely to become more attractive as a move to an ATM-based Broadband ISDN (B-ISDN) occurs, is to use a connectionless switch for interconnecting the sub-networks. This is likely to be the approach adopted by manufacturers who make their equipment to conform to the Multipoint Bridging Standard being specified by the IEEE under project 802.6A. The term Multiport Bridge is a pseudonym for a DQDB switch.

There are currently two views on how connectionless service may be handled in an ATM based B-ISDN. Firstly, a connectionless broadband service could be transparently mapped on to the connection oriented ATM layer. This approach may lead to inefficiency in the use of virtual channels due to the need to reserve connections or at least have semi-permanent Virtual Circuit Identifiers (VCIs) between connectionless users. The second approach is to use a connectionless 'server' function in the broadband network. All connectionless information could be sent to this 'server' and it would cope with the forwarding of these connectionless messages to their destinations. This approach would also require some reserved VCI space, or a call set-up overhead, to be associated with each connectionless transfer.

A third option not included in the draft CCITT recommendation is the subject of the present invention.

According to the present invention there is provided a method of transmitting variable length messages on a telecommunications network from a source to a destination via an ATM or DQDB switch in fixed length cells or slots which include a header field and a payload field wherein the method includes providing a segment type field, a sequence number field and a message identifier field in the payload field and wherein the routing information is obtained without use of the Virtual Path or Circuit Identifiers.

The method obtains the routing information from the connectionless messages destination address field which may conform to the E.164 numbering plan recommended by the CCITT for the ISDN era.

A connectionless cell switch would preferably be cheap to implement and operate. It should also be compatible with, or upgradeable to, a future connection oriented ATM/DQDB switch for ease of interworking of connectionless and connection oriented cell based information.

A suitable Connectionless Cell Switch (CCS) would typically contain a 16 x 16 switching element comprising a pair of back-to-back switch devices such as are described in co-pending U.K. Patent Applications Nos. 8917530.1 and 9019340.0 which are incorporated herein by reference thereto.

These switches perform cell routing by the use of "routing digits" or tags which are appended to the cell, which digits designate from which port the cell is to be sent out. These routing digits will be associated with the MID field of the connectionless or ATM cell DQDB slot. The MID field itself is associated with the destination address information, possibly conforming to CCITT Recommendation E.164 included in the connectionless Protocol Data Unit (PDU). This address information is contained in the first slot containing the first segment of the PDU. The same is true for AAL-4 PDUs which can also be used to send connectionless information.

Rate adaption will be required to convert the rate of the incoming connection to that of the switch and the management processor as it is expected that the switch will operate asynchronously of its ports and connection of dissimilar line rates will be possible.

Linecards will still be required and will also perform the DQDB Access Termination functions where necessary.

Instead of performing a look-up function using VPI/VCI as in connection oriented service, the E.164 address will be used to index a small data base of known port/E.164 mappings.

The Connectionless Cell Switch (CCS), has its initial application, in switching connectionless traffic contained in DQDB

connectionless Queue Arbitrated (QA) slots. It would, however, be able to handle Isochronous Pre-Arbitrated (PA) and Connection Oriented (QA) DQDB slots as well. An ATM based connectionless service could then be provided by simply changing the Line Termination Card and using a reserved, or a small set of reserved, VCI values which could be groomed out by the front end of the connection-oriented switch and passed to the CCS.

The operation of the switch for the DQDB connectionless service would be the same as for a B-ISDN connectionless service therefore the term 'cell' is used below to mean either a DQDB slot or an ATM cell.

An incoming cell could be, identified as connectionless by its reserved VPI/VCI value. If the cell was identified as a SSM or a BOM cell, the address (E.164) and MID values would be passed to a Management Processor. The Management Processor would then use a look-up database to discover which switch port is associated with the address (E.164) and appending a tag to the cell for use by a Header Translation Unit and Switch Management Unit. This function is broadly similar to the server functionality required in the second of the B-ISDN proposals for implementing a connectionless service. Any subsequent cells received with a MID value corresponding to the MID value associated with the address (E.164) and assigned tag values would automatically have the tag appended and be sent into the switch unit and directed to the relevant switch port.

CCS DQDB Isochronous and Connection oriented service operations are specific to the use of the CCS in a DQDB environment and would be switched on their VCI/VCP values alone. This would entail a connection oriented type of management being implemented alongside the connectionless management described above. However, this would also be the case for any DQDB Multiport Bridge which supports these services as well as the basic DQDB connectionless service.

The above description has been of one embodiment of the invention by way of example, and is not intended to limit the scope of the invention. Alternative ways of implementing and improving the invention will readily be appreciated by those skilled in the art.

CLAIMS

1. A method of transmitting variable length messages on a telecommunications network from a source to a destination via an ATM or DQDB switch in fixed length cells or slots which include a header field and a payload field wherein the method includes providing a segment type field, a sequence number field and a message identifier field in the payload field and wherein the routing information is obtained without use of the Virtual Path or Circuit Identifiers.

2. A method as claimed in Claim 1 wherein the routing information is obtained from a connectionless messages destination address field.

3. A method as claimed in Claim 2, wherein the destination address field conforms to the CCITT ISDN E.164 numbering plan.

4. A method as claimed in Claim 3, wherein the destination address field is used to index a database of port mappings.

5. A method as claimed in any preceding claim wherein the messages are contained in DQDB connectionless Queue Arbitrated timeslots.

6. A method as claimed in Claim 3 or 4 comprising the steps of:

(i) identifying a cell as a Single Segment Message Cell or a Beginning of Message Cell;

(ii) routing the address and Message Identifier values to a Management Processor;

(iii) using the Management Processor to determine which switch port is associated with the address;

(iv) appending a tag to the cell for use by a Header Translation Unit and a Switch Management Unit.

7. A method as claimed in Claim 1 and substantially as hereinbefore described.

Patents Act 1977
Examiner's report to the Comptroller under Section 17 (The Search Report)

Application number
9206253.8

Relevant Technical fields

(i) UK Cl (Edition K) H4P (PP5)

(ii) Int Cl (Edition 5) H04L 12/56 12/28

Search Examiner
K WILLIAMS

Databases (see over)

(i) UK Patent Office

ONLINE DATABASE: WPI, INSPEC

(ii)

Date of Search
23 JUNE 1992

Documents considered relevant following a search in respect of claims 1-6

Category (see over)	Identity of document and relevant passages	Relevant to claim(s)
	NONE	

Category	Identity of document and relevant passages	Relevant to claim(s)

Categories of documents

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E: Patent document published on or after, but with priority date earlier than, the filing date of the present application.

&: Member of the same patent family, corresponding document.

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